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describes *Opisthophus degener*, a new genus and species of snake, with the maxillary edentulous, except at its posterior extremity, where it bears a very long sulcated tooth. The same naturalist, in conjunction with G. Doria, describes *Zoötoea atlantica* from the Canary isles.—Dr. Bean notices in the Proceedings of the United States National Museum a collection of birds made by him in the summer of 1880 in Alaska and Siberia.—L. Stejneger publishes in the same Proceedings outlines of a monograph of the swans, and Mr. L. M. Turner describes some variations in *Lagopus mutus* and its allies from the Arctic regions, especially the western coast of Arctic America.

PHYSIOLOGY.¹

PHYSIOLOGICAL AUTOMATICITY.—Automatic and spontaneous movement is one of the powers of undifferentiated protoplasm, but it has been generally supposed that among the higher classes of animals all automatic and spontaneous actions are brought about by impulses proceeding from certain nerve cells. Thus the contractions of the heart, which still proceed with a definite rhythm after the organ is removed from the body, are supposed to be excited by rhythmic discharges from the nerve cells, which are contained within the cardiac walls. Dr. Gaskell has lately shown, however, that when a slender strip of muscle, perfectly ganglion free, is cut from the apex of a tortoise's heart and hung up in a moist chamber, after the lapse of some four hours the strip commences to contract rhythmically and may continue thus automatically active for some twenty to thirty hours. The initial period of quiescence which follows the suspension may be shortened about one-half if the strip of muscle be stimulated at intervals by a very feeble electrical current. "Every part of the muscular tissue of the tortoise heart possesses the property of spontaneous rhythmical contraction, and the difference in function between the muscular tissue of one part and that of another depends upon the extent to which that property has become on the one hand specially developed or on the other hand rudimentary, owing to the greater development of some other property, such as rapidity of contraction, which was more advantageous for the efficiency of the heart as a whole. In the muscular tissue of the frog's ventricle this rhythmical property seems to be still more rudimentary than in the tortoise."—*Proc. Cambridge Phil. Soc. Vol. iv, pt. 5.*

THE PRODUCTION OF THE SECOND HEART SOUND.—"In the twenty-third volume of Pflüger's Archiv, Professor S. Talma describes experiments which show that the sound produced by the sudden tension of a membrane, loosely stretched across the lower end of a vertical tube filled with water, varies in pitch inversely

¹ This department is edited by Professor HENRY SEWALL, of Ann Arbor, Michigan.

as the height of the fluid column. Hence he infers that the sound comes from the fluid and not from the membrane. Further, that as the membrane is subjected to unequal pressure on its opposite sides, is in fact distended by the weight of the water, it is not able to produce sonorous vibrations. He then concludes that the second sound of the heart, which is produced by the impact of a fluid column, the arterial blood, against membranous septa, the semilunar valves, originates in the vibration of the blood, and not of the valves."

On repeating these experiments by a modified method, C. E. Webster concludes that the second sound of the heart is the combined result of the vibrations both of the fluid blood column and of the membranous semilunar valves.—*Journ. of Physiology*, Vol. iii, p. 294.

A SIMPLE METHOD OF DEMONSTRATING THE ALKALINE REACTION OF THE BLOOD.—A drop of blood, obtained by pricking the finger, is placed upon the smooth colored surface of a piece of the dry, faintly reddened, *glazed*, litmus paper, and after a few seconds is wiped off with the corner of a handkerchief or clean linen rag moistened with water. The place where the blood has stood is seen to be marked out as a well-defined blue patch upon the red or violet ground. Nothing can be clearer or more convincing than the demonstration of the natural alkalinity of the blood which is afforded by this simple experiment.—*E. A. Schäfer*, *Journ. of Physiology*, Vol. iii, p. 292.

INFLUENCE OF LIGHT UPON BACTERIA.—Th. W. Engelmann describes a new form of Bacterium, called by him *B. photometricum*, which exhibits some remarkable reactions toward light. This bacterium moves only when illuminated, coming to a state of rest or motion according as it is removed from or is brought into the light.

Access of oxygen is favorable and probably necessary to motion, but the gas has not the stimulating effect of sunlight. The rapidity of movement increases proportionately with the intensity of illumination, and motion gradually ceases on removal from the light. Long continued action of very strong light, especially when little oxygen is present, brings the Bacteria to rest. Sudden diminution in the intensity of illumination produces remarkable agitation, such as rapid rotary movements. When the field of the microscope is partially shaded the Bacteria are seen to accumulate in the brighter portions, actively avoiding the dark parts of the field. This sensitiveness to differences in illumination was greater or less respectively as the supply of oxygen was diminished or increased.

When the field of the microscope is illuminated by pure spectral colors, most of the Bacteria wander into the region of the ultra-red rays where they are heaped in a narrow, sharply bounded

band. A smaller number collect under the yellow and orange rays and form there a pretty well-defined band. The few remaining forms are scattered in the more refrangible parts of the spectrum and more especially in the green rays. For the violet rays the limits of sensitiveness of the Bacteria is not far from that of the human eye, but their appreciation of the ultra-red rays goes much beyond that of the eye. It is the ultra-red rays that are most abundantly absorbed by the Bacteria and which act most powerfully in exciting them to motion.—*Pflüger's Archiv*, Bd. 30, S. 95.

THE DIASTATIC ACTION OF SALIVA.—It has generally been believed that the activity of the ferment *ptyalin*, which in normal human saliva rapidly turns starch into sugar, was arrested when the alkalinity of the saliva was neutralized or the fluid made slightly acid, and that therefore the conversion of starch of the food into sugar, which is begun in the mouth, was completely arrested when the food reached the acid juice of the stomach. The late work of Chittenden and Ely (*Journ. of Physiology*, Vol. III, p. 337), and of Langley and Eves (*Ibid*, Vol. IV, p. 18) has shown that the diastatic action of neutralized saliva is more rapid than that of the normal fluid, and that the addition of very minute quantities of sodium carbonate has a destructive effect upon the ferment. The former authors found that the addition of a small amount of acid, .025 p. c. HCl, destroyed to a great extent the starch converting power of saliva, but that when a small quantity of peptone was also added, the diastatic action of the ferment was increased above the normal. Langley and Eves point out that the peptones probably exert their favorable influence through combining with the free acid added to the saliva, thus preventing its destructive influence upon the ptyalin; for they find that the slightest amount of free acid in the mixture arrests the ferment action.

There is good reason to suppose that the gastric juice secreted during the first three-fourths of an hour after the beginning of digestion contains little if any free acid; so it is highly probable that the diastatic action of saliva continues for some time after the entrance of food into the stomach, though it seems certain that the salivary ferment is finally destroyed by the acid contained in the gastric juice.

VARYING THE THERMAL BACKGROUND OF REFLEX PERCEPTION.—The background of conscious perception, physiologically speaking, is defined by W. T. Sedgwick as "that standard (usually unconsciously held) with which we compare any stimulus which awakens consciousness." We perceive difference of relative intensity between a specific stimulus and its background. The latter may vary so that a stimulus which will to-day cause consciousness or motion will not do so to-morrow. Instead of studying

the reflex background by means of inhibitions, the author varies the background as a whole thermally, and observes its effect on reflexes. A reflex or headless frog may be heated so slowly that although the heart may beat very fast, *rigor caloris* may be caused without any motor reaction of its limbs. If the heart be tied before hand, reflexes occur from gradual heating. This the author thinks explained by assuming that in the first case the hot blood passing inward equalizes the progressive heating throughout, or changes the thermal background; while in the second case, with no circulation, the background is fixed and the surface temperature rises to the point of difference which causes movement.—*Science*, Vol. i, No. 5, p. 152.

ACTION OF DIGITALINE ON THE CIRCULATORY ORGANS.—(Preliminary note by H. H. Donaldson and L. T. Stevens). The continuation of the experiments begun last year has yielded the following results: The work done by the heart of the common frog is decreased by digitaline, whatever the dose, as was previously shown to be the case for the heart of the "slider" terrapin. In both frog and terrapin, the decrease occurs, whether the aortic valves are intact or not. Variations in arterial or venous pressure do not affect the result.

By a method permitting direct measurement of the fluid circulating through the viscera and lower extremities in a unit of time and under constant pressure, it has been determined for the frog that the arterioles are constricted by digitaline. On this point the terrapin has not yet been investigated. Digitaline has also been shown to increase mean blood pressure in both frog and terrapin. We have, then, for the frog under digitaline a decrease in the work done by the heart, a rise of mean blood pressure, and a constriction of the arterioles. The first and second of these points have been already demonstrated for the terrapin as well.—*Science*, Vol. i, No. 5, p. 149.

PERCEPTION OF LIGHT AND COLOR BY THE LOWEST PLANTS AND ANIMALS.—The instances in which these faculties are exhibited in the lowest forms even extending to some true plants, are very numerous, but hitherto have met with little explanation. T. W. Engelmann suggests three principal modes by which light is able to affect these organisms, viz: 1. Directly, by modification of the interchange of gases, without apparent addition of sensation. 2. By modification of the sensation of necessity for breathing, owing to modification of the interchange of gases. 3. By setting up a specific process, which probably answers to our sensation of light. Of these the first may occur either alone or in combination with the second; simultaneous occurrence of the first and third may possibly take place.

1. Navicula is taken as the type of the first method, and most mobile Diatomaceæ and Oscillarineæ belong to the same class.

Movement is here intimately connected with the presence of free oxygen, which, if not present, can be produced by these organisms in the light.

2. *Paramœcium bursaria*. When the proportion of oxygen is normal, or somewhat greater than the normal amount, the infusorian is usually very quiet; if, however, it sinks ever so little below this degree, the animal becomes restless, and makes for places in which there is more oxygen (*e. g.*, edge of cover-glass); in good light, but under otherwise similar conditions, the specimens distribute themselves equally throughout the drop. Active swimming is the consequence of serious diminution of the oxygen; if strong light is then applied for some minutes, the *Paramœcium* courses rapidly about, and if insufficient supplies of oxygen are added from without, it shows itself very sensitive to alterations in the illumination in the spectrum; it prefers red of between the lines B. and C. High tension of oxygen reacts strongly on the movements, for the animals then tend to swim straight or in wide curves away from the point at which oxygen is present in abundance. Strong illumination applied suddenly at this time causes violent movements, and the *Paramœcium* often darts into the darkness, exhibiting the phenomenon of protophobia. Thus this animal is highly sensitive to differences in the tension of oxygen.

3. *Euglena viridis* is taken as the third type. Here the tension of oxygen has little to do with the movements. When the drop of water is partially illuminated the *Euglenæ* gradually assemble in the lighted area, and usually remain there; if a shadow is thrown upon the anterior chlorophyll-less portion of the body the animal turns and behaves as if wholly in darkness. This is not due to the eye-spot which is placed here, as the reaction is affected when the darkness first reaches the protoplasm outside it. This sensitiveness of the anterior end of the body is generally distributed amongst animals, and occurs in *Paramœcium bursaria*, in spite of the greater amount of chlorophyll contained in the posterior part. Engelmann has not as yet succeeded in finding blind or color-blind *Euglenæ*, but individuals from different localities and in different stages of development often show important variations in their sensitiveness to light.—*Journal Roy. Microscopical Society, Feb.*

PSYCHOLOGY.

ROMANES' ANIMAL INTELLIGENCE.¹—Our purpose in noticing this excellent book is rather expository than critical. We will first notice the introduction to the work, and in subsequent paragraphs give the author's statements as to our present knowledge of the mental endowments of the different groups of animals in

¹Animal Intelligence. By George J. Romanes. International Scientific Series. New York, D. Appleton & Co., 1883, 12mo, pp. 520.